

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims:

1. (Original) A communication spacecraft for providing cellular communications among a plurality of user terminals and ground stations, by way of paths having a bandwidth generally suited for audio signals, and for also providing communications among at least said ground stations by way of at least one path having a bandwidth at least five times greater than said bandwidth suitable for audio signals, said spacecraft comprising:

a downlink antenna including a plurality of antenna elements, for receiving guided electromagnetic energy at each of said antenna elements, and for radiating said energy in the form of unguided radiation:

an analog beamformer including a plurality of beam input ports and a plurality of elemental antenna ports, each of which is coupled to one of said antenna elements, for producing at least one independent beam of electromagnetic downlink radiation from guided energy applied to each of said beam input ports, so that plural downlink antenna beams are formed when signals are applied to a plurality of said beam input ports of said analog beamformer;

receiving means for receiving unguided electromagnetic uplink radiation including at least one carrier, and for at least transducing said unguided electromagnetic uplink radiation into guided electromagnetic energy on a plurality of separate paths;

a narrowband digital channelizer having

individual channel bandwidths suitable for audio signals, said channelizer including a plurality of input ports and a plurality of output ports, at least some of said input ports of said digital channelizer being coupled by way of corresponding ones of said plurality of separate paths to said receiving means, for receiving said guided electromagnetic energy from a plurality of said separate paths, and for extracting each of said independent narrowband signals from said at least one carrier, to thereby produce separated independent narrowband signals on said plurality of output ports of said digital channelizer;

a wideband channelizer having an individual channel bandwidth at least five times greater than that of an individual channel of said narrowband channelizer, said wideband channelizer being coupled to at least a portion of said receiving means, for extracting at least one wideband signal from said carrier, to thereby produce separated independent wideband signals;

a switching arrangement coupled to said plurality of output ports of said narrowband channelizer and to said wideband channelizer, for receiving said independent narrowband signals and said wideband signals, and for grouping together those signals associated with each of said plural downlink antenna beams, to thereby produce combined signals grouped by beam, where said combined signals may include any number of said wideband signals, including the number zero; and

a coupling arrangement coupled to said switching arrangement and to said beamformer, for coupling said combined signals grouped by beam to that one of said input ports of said beamformer associated with the beam of said group.

2. (Original) A communication spacecraft for providing cellular communications among a plurality of user terminals and ground stations, by way of paths having a bandwidth generally suited for audio signals, and for also providing communications among at least said ground stations by way of at least one path having a bandwidth at least five times greater than said bandwidth suitable for audio signals, said spacecraft comprising:

an uplink antenna including a plurality of antenna elements, for receiving unguided electromagnetic energy including at least one uplink carrier at each of said antenna elements, and for transducing received unguided radiation into guided waves at a guided-wave port:

an analog beamformer including a plurality of beam output ports and a plurality of elemental antenna ports, each of which is coupled to one of said antenna elements, for producing at least one independent uplink antenna beam signal at each of said beam output ports from guided energy applied to said elemental antenna ports, so that plural uplink antenna beam signals are formed when signals are applied to a plurality of said elemental antenna ports of said analog beamformer;

receiving means for receiving said uplink antenna beam signals, and for at least downconverting said uplink antenna beam signals to produce downconverted uplink antenna beam signals;

a narrowband digital channelizer having individual channel bandwidths suitable for audio signals, said channelizer including a plurality of input ports and a plurality of output ports, at least some of said input ports of said digital channelizer being coupled by way of separate paths to said receiving means, for receiving said downconverted uplink antenna beam signals, and for separately

processing each of said independent narrowband signals in a manner which associates each of said independent narrowband signals with other such independent narrowband signals destined for a particular downlink antenna beam, to thereby produce independent narrowband signals combined on a beam-destination basis on said plurality of output ports of said digital channelizer;

a wideband channelizer having an individual channel bandwidth at least five times greater than that of an individual channel of said narrowband channelizer, said wideband channelizer being coupled to at least a portion of said receiving means, for extracting at least one wideband signal from the received signal, to thereby produce separated independent wideband signals;

a switching arrangement coupled to said plurality of output ports of said narrowband channelizer and to said wideband channelizer, for receiving said independent narrowband signals and said wideband signals, and for grouping together those signals associated with each of said plural downlink antenna beams, to thereby produce combined signals grouped by beam, where said combined signals may include any number of said wideband signals, including the number zero; and

a coupling arrangement coupled to said switching arrangement and to said beamformer, for coupling said combined signals grouped by beam to that one of said input ports of said beamformer associated with the beam of said group.

3. (Original) An apparatus according to claim 2, wherein said downconverting means downconverts said downconverted uplink antenna beam signals to baseband.

4. (Original) An apparatus according to claim

2, wherein said narrowband digital channelizer further comprises return link upconverters associated with at least some of its output ports, for upconverting said independent narrowband signals to an intermediate frequency.

5. (Original) An apparatus according to claim 3, wherein said wideband channelizer comprises an upconverter for upconverting said downconverted uplink antenna beam signals to produce upconverted received signals.

6. (Original) An apparatus according to claim 5, wherein said wideband channelizer comprises at least one wideband filter for filtering said upconverted received signals.

7. (Currently Amended) A method for transmitting, through an analog beamformer, wideband signals and at least some of a plurality of independent signals, each of which independent signals has a bandwidth no greater than one-fifth of that of said wideband signals, said method comprising the steps of:

receiving unguided electromagnetic radiation including (a) a plurality of said independent signals ~~++~~ having bandwidths suitable for audio use, each of said independent signals being modulated onto a subcarrier which is in turn modulated onto a carrier and (b) said wideband signals, to thereby produce guided electromagnetic energy signals representing combined wideband signals and narrowband independent channels;

channelizing said signals representing combined wideband signals and narrowband independent channels, to thereby extract separated independent narrowband signals;

channelizing said signals representing combined wideband signals and narrowband independent channels, to thereby extract separated wideband signals;

combining those of said separated independent narrowband signals and said separated wideband signals which are associated to be downlinked over a particular downlink antenna beam, to thereby produce antenna beam signals;

beamforming said antenna beam signals to produce plural antenna element guided wave signals; and

coupling each of said antenna element guided wave signals to the guided wave input port of a different antenna element of an antenna array.

8. (Original) A method according to claim 7, wherein said step of channelizing said signals representing combined wideband signals and narrowband independent channels, includes the step of digitally channelizing said combined wideband and narrowband independent channels.

9. (Original) A method according to claim 7, wherein said step of channelizing includes the step of limiting the bandwidth of each of said independent signals to a bandwidth suitable for carrying of intelligible audio.

10. (Original) A method according to claim 9, wherein said step of limiting the bandwidth includes the step of limiting each of said independent signals to a bandwidth of no more than 10 KHz.